IBM-POUGHKEEPSIE
December 31, 1964

Diagnostic Engineering Publication
1410/7010

Subject: Diagnostic Program ST03C 1410 System Test (10K/20K)

Sequence Number 153
Replaces ST03B

ST03 requires system and channel control cards. These cards must be punched in accordance with the instructions given in the "1410/7010 Introduction", Volume 1.00, before the test can be run from cards.

System Control Card	ST03 001
Channel 1 Control Card	ST03 002
Channel 2 Control Card	ST03 003

The following changes were made to ST03B to create ST03C:
(All pages to which changes have been made are dated 12/31/64.)

1. Channel 2 READER & PUNCH pockets selected are the same as channel 1.
2. The channel 1 & 2 test for overlap routines have been changed to correct a problem that existed when two channels of Unit Record equipment were run in overlap mode. Too much time was taken between the I/O instruction and the test for overlap instruction resulting in an overlap error message.
3. Channel 2 Status Indicator and Not Ready routines changed to correct problem of dropping channel 1 I/O units after a channel 2 I/O unit had gone NOT READY.
4. Minor changes to increase running speed.
5. The tape rewind routines in the initialization procedure were changed to check the Channel Cards for tape before rewinding and to wait for the rewinding to be completed before starting channel testing.

Enclosures: 48 Pages
Card Deck for CARD ONLY SYSTEMS (as punched by UP51)
8 Cards - Card Loader (1-7) and 1 Core Clear
122 Cards No. 001-122 Data Cards
1 Card Execute Card

Distribution: X 1410 10K/20K only
7010
Other

ST03B

1410 SYSTEM TEST

for

10K/20K SYSTEMS

12/31/64

CONTENTS OF ST03 WRITE UP AND LISTING

3.00.00.0 TEST DESCRIPTION

00.1 MODIFICATIONS

See Release Page for description of changes from Level to Level.

00.2 DESCRIPTION

ST03 is a system test for a 1410 Data Processing System with a 10K or 20K memory (CPU model A1 or A2).[1]

The I/O devices used are:

1402-2	Card Reader - Punch
1442	Card Reader
1403	Printer, model 1 or 2
729/7330	Tape units
1011	Paper Tape Reader

These units are selected on the basis of their availability (according to information on the Channel 1 and 2 Control Cards) and used as they are found READY.
The Processing Overlap and Priority Features are used when they are available.
Three short CPU routines are included to cover the multiply, divide and edit instructions.

Operating in non overlap mode I/O units are selected sequentially and used if they are READY and not BUSY. On completion of a pass on the channel 1 I/O units,a similar pass is made on Channel 2, if it is available. Then the CPU routines are run, in Alert Mode if Priority is available. In between each CPU routine the channels are checked to see if they are still in operation or if any I/O unit found BUSY when it was first selected is no longer BUSY. At the end of the CPU routines 3 is added to the pass count and when the count reaches 1000 a program PASS is complete.

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1 For systems with larger memories consult the "Index of 1410/7010 Diagnostic Tests" for the system test applicable.

Operating in overlap mode devices are used on the same basis (READY and not BUSY). After the I/O operation is initiated in overlap on channel 1, channel 2 is checked to see if it is in process. If it is, the CPU routines are entered. If it is not the next I/O unit on channel 2 is started. As in unoverlapped operation in between each CPU routine the channels are checked to insure that they are kept in operation. When the CPU routines are complete a 1 is added to the pass counter. The test returns to the start of the CPU section to wait for an exit in between routines. Again when the pass counter reaches 1000 a program PASS is complete but in this case many more I/O operations have taken place than when in unoverlap mode.

Console inquires are only acknowledged during channel 1 operation at a point that will not disrupt the test operation. Channel 2 error messages are held up until they can be typed without disrupting channel operation.

For a more complete picture of overall test operation refer to the FLOW CHARTS, Section 3.00.06.0

00.3 EQUIPMENT REQUIRED

A basic 1410 system and either a card reader of tape unit from which to load the test into memory.

All of the other I/O units tested, F Channel, Processing Overlap and Priority Features are optional.

00.4 CARD DECK

A complete card deck of ST03 consists of:

7	cards	Load Program
1	card	Core Clear
122	data cards	Program Deck ST03
1	card	Execute Card (Branch to 02000)

NOTE: Card # 001 is a System Control Card
002 is a Channel 1 Control Card
003 is a Channel 2 Control Card

These cards do not have any system or channel information punched in them when they are released. See the "1410/7010 Introduction", Volume 1.00 for instructions on how to punch them.

00.5 EC LEVEL OF MACHINE

Not applicable.

3.00.01.0 LOADING PROCEDURES

Standard 1410/7010 Diagnostic Loading procedure is used. Refer to the "1410/7010 Introduction", Volume 1.00 for additional information.

3.00.02.0 OPERATING PROCEDURES

Load and set to READY status all I/O units to be tested. All units READY at the start of the test are used, except for tape drive 0. Drive 0 is not tested on either channel. Units may be added to or dropped from the test at any time by making the unit not READY. Additional tape drives can only be added to the test by restarting after they have been set to READY status. Caution must be exercised when pressing RESET on a tape drive while the drive is in use. It may cause the system to "hang up."

Program operation may be altered at any time by using the "Program Alter Routine". TADs are loaded as blanks and TAD locations are only tested for 1.

Standard TADs

TAD	Address	Not 1	1
TAD 0	01000	Do Not	Bypass Typeouts
TAD 1	01001	Do Not	Loop on Routine
TAD 2	01002	Do Not	Halt on Error
TAD 3	01003	Do Not	Repeat Program

Special TADs

TAD 4	01004	Do Not	Use Overlap
TAD 5	01005	Do Not	Use Priority

NOTE: After changing TAD 4 the test must be restarted to change the mode of operation. This can be accomplished by using RESET and START or ADDRESS SET to 02000.

3.00.03.0 OPERATING HINTS, COMMENTS

03.1 Loading ST03 from the Card Reader:
ST03 should not be run from cards with any other program decks stacked behind it. It can be run as one of a series of diagnostic tests if it is the last one. This is advised because ST03 uses the card reader if it is READY. No attempt is made to discriminate between a program deck or a test deck. Any card deck is acceptable reader input.

03.2 Caution is urged when using non-pattern decks as card reader input. On completion of one PASS of ST03, TAD 3 is checked to determine whether the test is to be repeated or the next test read in. If TAD 3 is not 1 the load program reads in the cards in the reader. If these cards are in program card format but not a test i.e. old card decks used as input, they will be read into memory and probably destroy ST03, or parts of it at least.

03.3 The error typeout:

UNKNOWN INTERRUPT is the result of one of two things:

1. A branch on channel 1 inquiry priority request or a branch on inquiry was taken but the request was not satisfied by a Read Console Printer operation.[1]

2. An interrupt occurred and no branch on channel 1 or 2 overlap priority request or channel 1 or 2 unit priority request or inquiry priority request was taken.

In either case the request should be serviced or the indicator reset. The typeout can be bypassed by operating without priority (Set TAD 5 to 1)on systems with the Priority Feature.

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[1] Indiscriminate use of the INQUIRY REQUEST and INQUIRY CANCEL keys may also be a cause.

3.00.04.0 PROGRAM STOPS, RESTARTS

04.1 STOPS

Normal

There are no Normal Stops in ST03

Error

Programmed Error Stops may occur for the following reasons:

a) one of the CPU routines did not produce the correct results. This is extremely unlikely without a SYSTEM CHECK occurring first. There are three such stops possible and there is no error message typed. These three Stops are not under TAD control.

b) an unconditional halt follows the message "UNKNOWN INTERRUPT". Refer to OPERATING HINTS Section 3.00.03.3 for further information on unknown interrupts.

c) stops occurring when TAD 2 is set to 1 are provided following all other error message typeouts.

04.2 PROGRAM RESTARTS

After all programmed STOPs, START causes the test to resume with the next sequential instruction. COMPUTER RESET and START causes the test to be restarted from the beginning repeating all initialization.

3.00.05.0 TYPEOUTS

05.1 NORMAL or NON-ERROR TYPEOUTS

ST03A — Test Identification, typed during initialization at the start of the test.

PASS — Typed on completion of one program pass. A program PASS is completed when the pass counter reaches 1000. This count depends on the mode of operation. Refer to the DESCRIPTION section 3.00.00.2 for more complete information.

05.2 ERROR TYPEOUTS

All error typeouts are given unless TAD 0 is set to 1. They are the result of some status indicator being set or the failure to met an expected condition.

All status indicator error messages are preceded by asterisks and are typed in the following format:

```
* L@B706500R      4
        a         b
```

Where:

"a" is the instruction issued and

"b" is the d - modifier of the test and branch instruction used to test the indicators. In this case the indicator set is DATA CHECK (4).

Under the category of failure to meet an expected condition:

NO BOL AFTR M*4806752W

is self explanatory. The instruction is the actual instruction issued and a J(I)2 was not taken. No status indicator was set.

One other error typeout is possible:

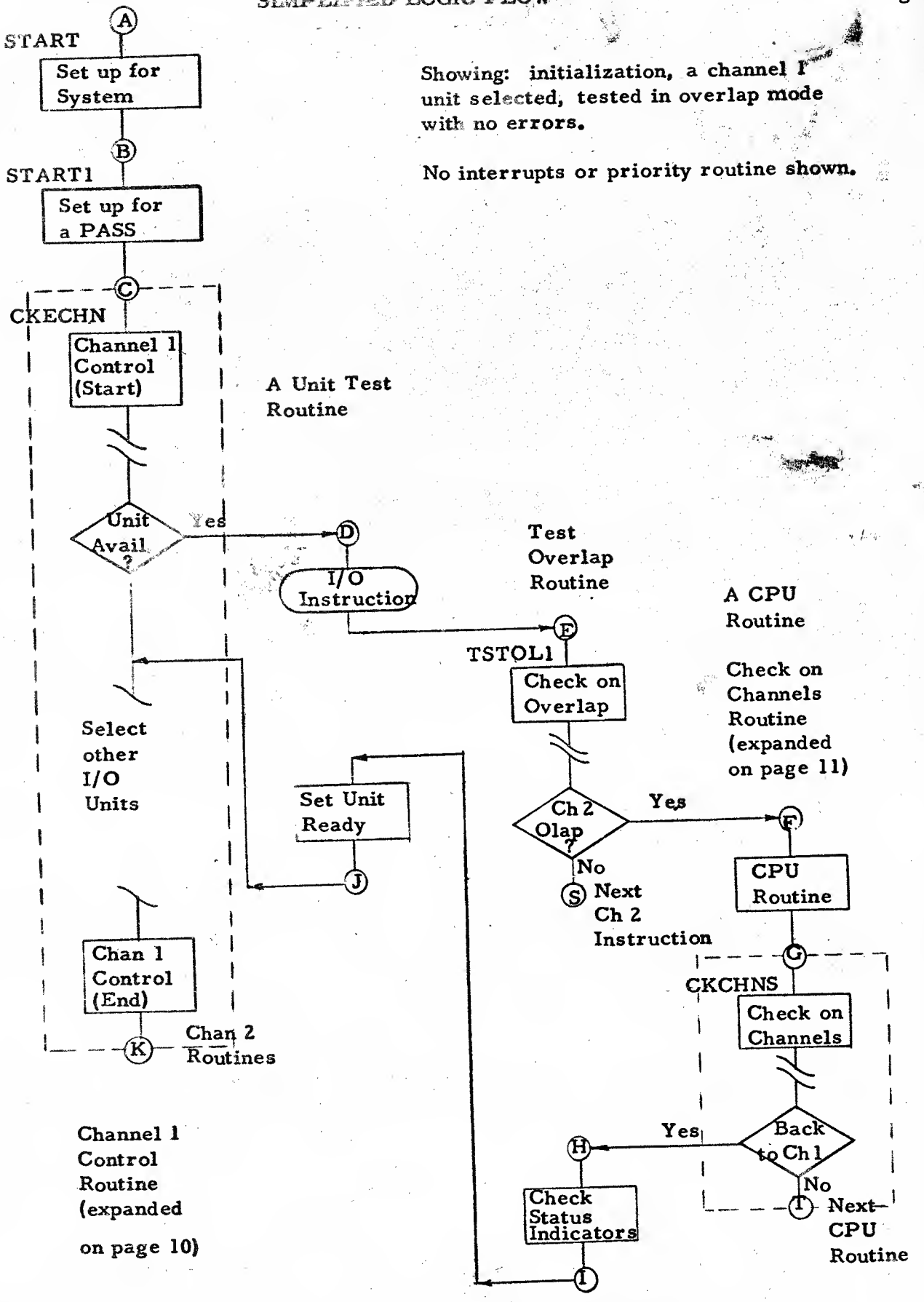
UNKNOWN INTERRUPT

The reasons for this typeout and courses of action advisable are covered in OPERATING HINTS, COMMENTS, Section 3.00.03.3.

SIMPLIFIED LOGIC FLOW

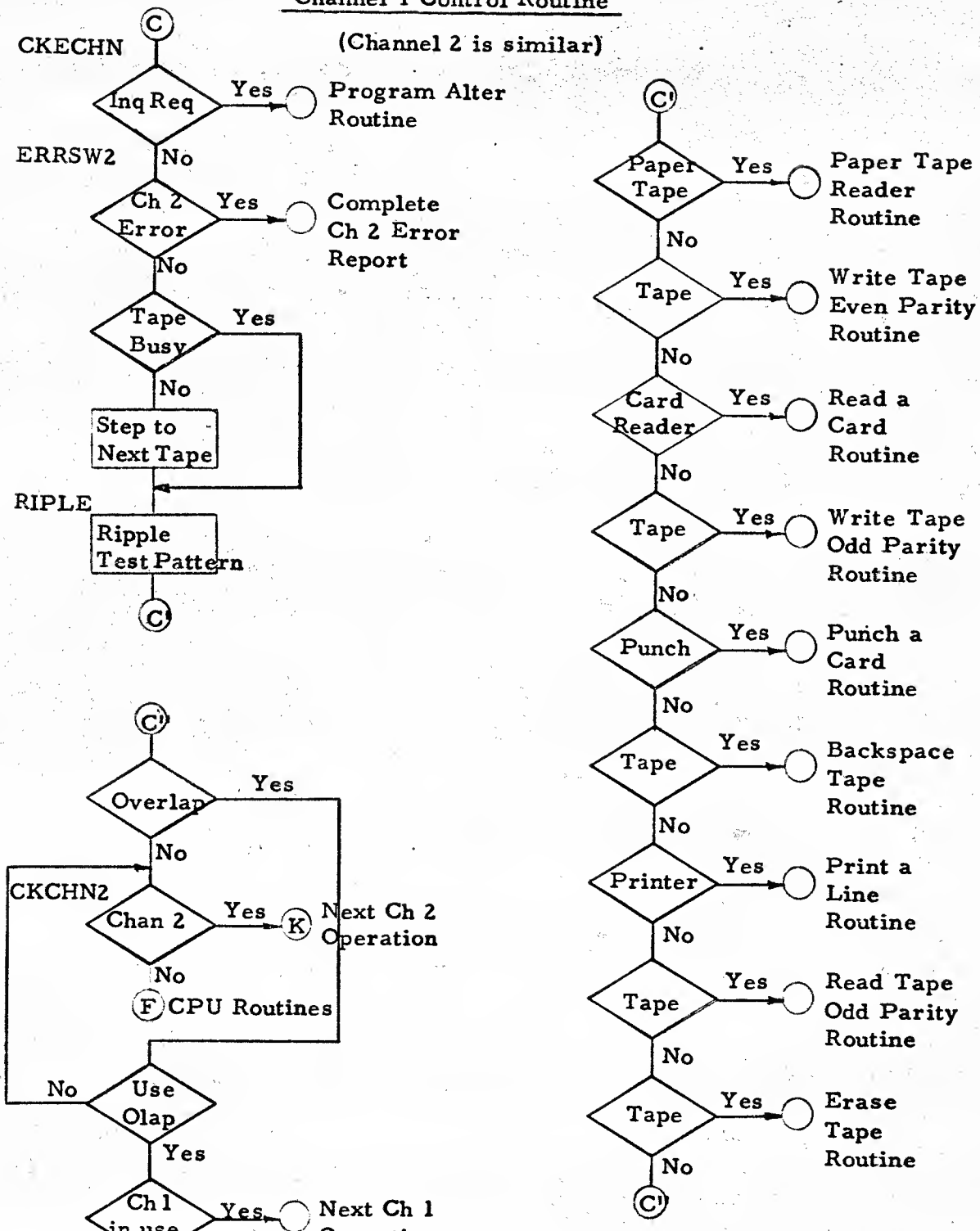
Showing: initialization, a channel 1 unit selected, tested in overlap mode with no errors.

No interrupts or priority routine shown.



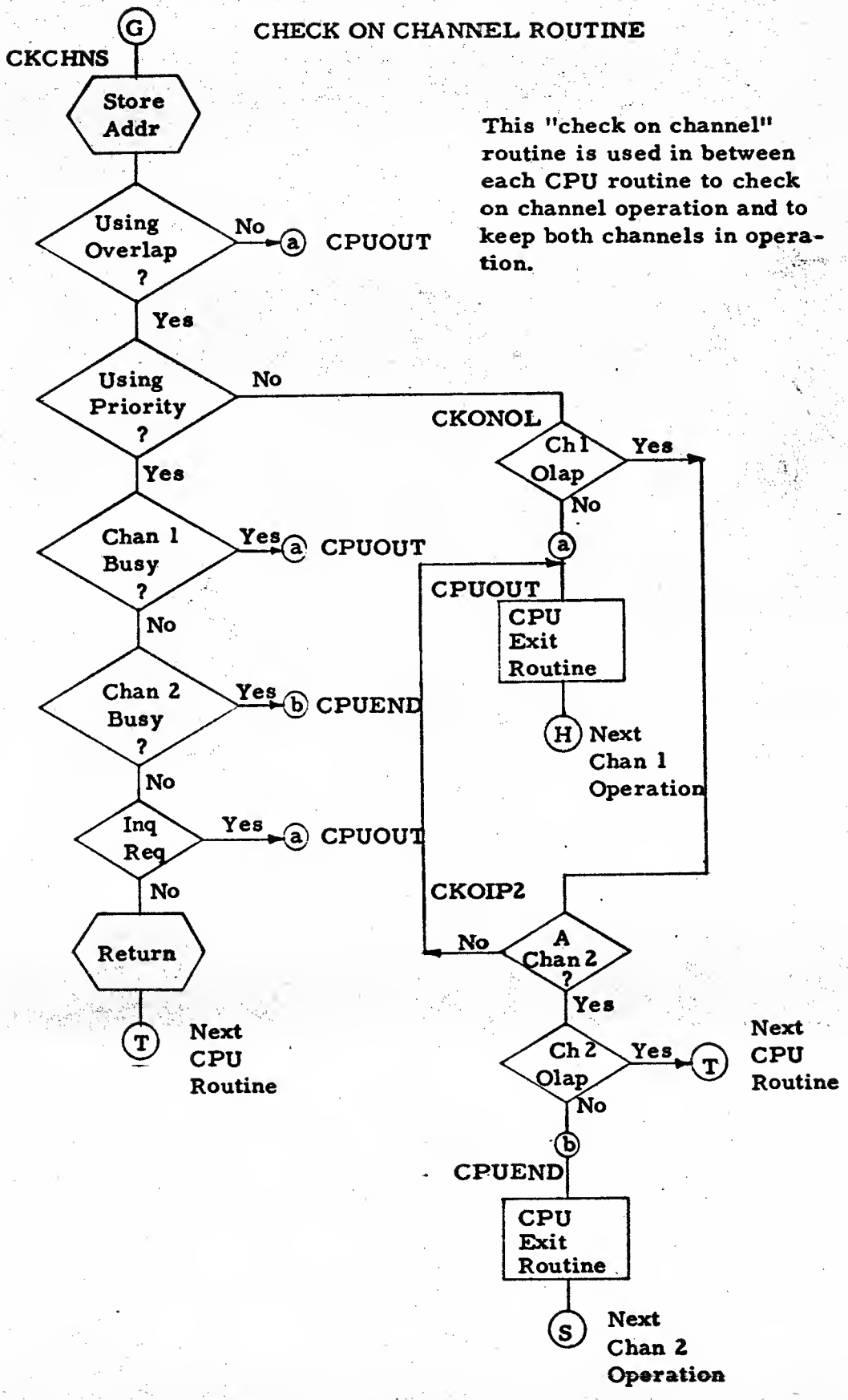
Channel 1 Control Routine

(Channel 2 is similar)



Branches are taken if the channel control card indicates the unit is available.

CHECK ON CHANNEL ROUTINE



This "check on channel" routine is used in between each CPU routine to check on channel operation and to keep both channels in operation.

```
LABEL     OPCOD  OPERAND                                          CT  ADDRS  INSTRUCTION

LOADER    EQU    400

                 ASSIGNMENT OF INDEX REGISTERS

   X1      CHANNEL 1 ROUTINE - ADDRESS OF NEXT CHAN 1 INSTRUCTION
   X2      CHANNEL 2 ROUTINE - ADDRESS OF NEXT CHAN 2 INSTRUCTION
   X3      C P U ROUTINES - ADDRESS OF NEXT C P U INSTRUCTION
   X4      CHANNEL 1 I/O INSTRUCTION - ADDRESS OF LAST ONE ISSUED
   X5      CHANNEL 2 I/O INSTRUCTION - ADDRESS OF LAST ONE ISSUED
   X6      C P U ROUTINES - ADDRESS OF NEXT C P U  SUB ROUTINE
   X7      ADDR OF RETURN TO CH 1 CONTROL ROUTINE FROM UNIT TEST RT
   X8      ADDR OF RETURN TO CH 2 CONTROL ROUTINE FROM UNIT TEST RT

   WRITE1  B-ADDR FOR PRINTER CH 1 - SET UP FOR 100/132 CHAR BUFFER
   WRITE2  B-ADDR FOR PRINTER CH 2 - SET UP FOR 100/132 CHAR BUFFER
   SXRA    UTILITY - USED MAINLY FOR TAPE DRIVE NUMBER CH 1
   SXRB    UTILITY - USED MAINLY FOR TAPE DRIVE NUMBER CH 2
   SXRC    UTILITY - USED MAINLY FOR UNIT SELECT CHARACTER CH 1
   SXRD    UTILITY - USED MAINLY FOR UNIT SELECT CHARACTER CH 2
```

```
LABEL     OPCOD  OPERAND                                          CT  ADDRS  INSTRUCTION
                 1000                                                 01000
*                *****  STANDARD  TADS    *****
                        NOT 1              1
TA00      DC     a a    DO NOT    BYPASS TYPE OUTS                1  01000
TA01             a a    DO NOT    LOOP ON ROUTINE                 1  01001
TA02             a a    DO NOT    HALT ON ERRORS                  1  01002
TA03             a a    DO NOT    REPEAT PROGRAM                  1  01003

*                *****  SPECIAL   TADS    *****

TA04             a a    DO NOT    USE OVERLAP                     1  01004
TA05             a a    DO NOT    USE PRIORITY                    1  01005
GMWM      DCW    aMa                                              1  01006

*                PROGRAM ALTER ROUTINE

ALTER     SBR    ALTRXT&5          STORE RETURN ADDRESS            7  01007  G 01101 B
BA2SW1    NOP                                                      1  01014  N
          BA2    *&1               TURN OFF CH2 INTERLOCK          7  01015  X 01022 M
ENTER     RCP    ADDRES&4          ENTER LOCATION TO BE ALTERED   10  01022  H %TO 01057 R
          BEX1   ENTER,H           TRY AGAIN IF 1/2/4/8            7  01032  R 01022 M
          BNT1   BUFINQ            CANT BE SATISFIED BY CONSOLE READ 7 01039  R 01084 M
          BA1    *&1                                               7  01046  R 01053 M
ADDRES    RCPW   00000             ENTER DATA INTO ADDRES SPECIFIED 10 01053  L %TO 00000 R
          BEX1   ADDRES,S                                          7  01063  R 01053 M
          BA1    *&1                                               7  01070  R 01077 M
          B      ALTRXT                                            7  01077  J 01096

BUFINQ    BCE    CKTA05,SYS1&8,1   CHECK FOR PRIORITY ON SYSTEM   12  01084  B 01103 01264 1
ALTRXT    B      00000             RETURN TO PROGRAM               7  01096  J 00000
CKTA05    BCE    ALTRXT,TA05,1     NOT OPERATING IN PRIORITY MODE 12  01103  B 01096 01005 1
INTERR    B      TYP1                                              7  01115  J 05489
          DCW    aUNKNOWN INTERRUPTa,G                            17  01138
          H      START1            RESTART TEST                    6  01140  . 02007
          H                                                        1  01146  .
```

```
LABEL     OPCOD  OPERAND                                          CT  ADDRS  INSTRUCTION

          ORG    1239              *CONTROL INFORMATION                01239
          DCW    a0'11'1a          ANY 10K OR 20K SYSTEM            6  01244
                 a1VL'9a           SEQ# 153,10K,SYS TST,RELIAB MODE 5  01249

TESTID    DCW    aST03a            TEST IDENTIFICATION              4  01253
LEVEL  C  DC     aCa,G             SUFFIX LEVEL                     1  01254

*                 STANDARD SYSTEM CONTROL CARD

          ORG    1256     CHARACTER & PURPOSE        COL              01256
SYS1      DC     a a  ALPHA O,I,X - 1410,1410ACC,7010 13             1  01256
        &1 DC     a a  0,1,3,5,7,9-10,20,40,60,80,100K 14           1  01257
        &2 DC     a a              SPARE               15           1  01258
        &3 DC     a a  1,2-CHNL1 100,132 CHAR PRINTER  16           1  01259
        &4 DC     a a  1,2-CHNL2 100,132 CHAR PRINTER  17           1  01260
        &6 DC     a  a             SPARES              18-19        2  01262
        &7 DC     a a  1 - OVERLAP                     20           1  01263
        &8 DC     a a  1 - PRIORITY ALERT              21           1  01264
        &9 DC     a a  1 - PRIORITY EXTENSION CHAN 2   22           1  01265
       &11 DC     a  a             SPARES                           2  01267
       &12 DC     a a  1 - CHANNEL ONE PRESENT         25           1  01268
       &13 DC     a a  1 - CHANNEL TWO PRESENT         26           1  01269
           DC     a                ¢a  NOT INTERROGATED            19  01288
```

```
LABEL     OPCOD  OPERAND                                          CT  AODRS  INSTRUCTION

*                STANDARD CHANNEL 1 CONTROL CARD

          ORG    1289      CHARACTER & PURPOSE        COL             01289

CHN1      DC     @ @  1 - PAPER TAPE READER            13        1  01289
         &1 DC     @ @                    NOT INTERROGATED        1  01290
         &2 DC     @ @  1 - TAPES 729/7330               15        1  01291
        &11 DC     @       @        SPARES             16-24       9  01300
        &12 DC     @ @  R,S,C - 1402,1442,7223 READER    25        1  01301
        &13 DC     @ @                    NOT INTERROGATED        1  01302
        &14 DC     @ @  P - 1402 PUNCH                   27        1  01303
        &15 DC     @ @                    NOT INTERROGATED        1  01304
        &16 DC     @ @  P - 1403 PRINTER                 29        1  01305
        &17 OC     @                    @ NOT INTERROGATED       20  01325
            OC     @                   *@                        20  01345

*                STANDARD CHANNEL 2 CONTROL CARD

          ORG    1346      CHARACTER & PURPOSE        COL             01346

CHN2      DC     @ @  1 - PAPER TAPE READER            13        1  01346
         &1 OC     @ @                    NOT INTERROGATED        1  01347
         &2 DC     @ @  1 - TAPES 729/7330               15        1  01348
        &11 OC     @       @        SPARES             16-24       9  01357
        &12 DC     @ @  R,S,C - 1402,1442,7223 READER    25        1  01358
        &13 OC     @ @                    NOT INTERROGATED        1  01359
        &14 OC     @ @  P - 1402 PUNCH                   27        1  01360
        &15 DC     @ @                    NOT INTERROGATED        1  01361
        &16 DC     @ @  P - 1403 PRINTER                 29        1  01362
        &17 OC     @                    @ NOT INTERROGATED       20  01382
            OC     @                   *@                        20  01402
          ORG    1403                                              01403
```

```
LABEL     OPCOD  OPERAND                  COMMENTS                    CT  ADDRS  INSTRUCTION
*                *INSTRUCTION ALTERATION ROUTINE
*                ALTER FOR UNOVERLAP OR OVERLAP OPERATION

I-A-R     SBR    SXRA                     STORE ADDR OF DATA           7  01403  G 00074 B
          MLNA   4&SXRA,SXRB              SET START ADDR IN XR        12  01410  D 00..4 00079 /
IARSCN    SCNLB  09990,0&SXRB             SCAN TO B FIELD WM          12  01422  D 09990 00.,M0 -
          SBR    SXRB                     BAR IS B FIELD WM-1          7  01434  G 00079 B
          C      SXRB,9&SXRA              CHECK FOR STOP ADDR.        11  01441  C 00079 00..9
          BH     11&SXRA                  STOP ADDR. IS HIGHER         7  01452  J 00.J1 U
          MLCS   1&SXRB,*&12              MOVE CHAR TO TEST IT        12  01459  D 00.,M1 01482 3
          BCE    IARIOP,IAROPS,0          I/O OP CODE                 12  01471  B 01492 01513 0
          BCE                              CHECK CHAR UNDER WM          1  01483  B
          BCE                              IS IT ONE IN TABLE           1  01484  B
          B      IARSCN                   SCAN TO NEXT WM              7  01485  J 01422
IARIOP    MLCS   10&SXRA,2&SXRB           ALTER X1,CHAN-MODE          12  01492  0 00.J0 00.,M2 3
          B      IARSCN                   SCAN TO NEXT WM              7  01504  J 01422

IAROPS    OCW    @ULM@                    OP CODES SCANNED FOR         3  01513

*                                         *****

*                TYPING ROUTINE

TYP       SBR    TYPE&8                   STORE ADDRESS OF MESSAGE     7  01514  G 01536 B
          BAI    *&1                      RESET I/O INTERLOCK CH 1     7  01521  R 01528 M,G
TYPE      WCP    00000                    TYPE MESSAGE                10  01528  M %TO 00000 W
          SBR    TYPEXT&5                 STORE ADDRESS FOR RETURN     7  01538  G 01564 B
          BCBI   TYPE                                                  7  01545  R 01528 2,G
          BAI    *&1                                                   7  01552  R 01559 M
TYPEXT    B      00000                    RETURN TO MAIN PROGRAM       7  01559  J 00000
          H                                                            1  01566  .
```

```
LABEL     OPCOD  OPERAND                                          CT  ADDRS  INSTRUCTION

*                READY - NOT READY TABLE

*                LOCATIONS ARE BLANK WHEN I/O UNITS ARE READY AND
*                CONTAIN A UNIT SEL CHAR IF THE UNIT IS NOT READY

          ORG    *&X00                                                01600
RDYON1    DCW    @ @              NOT USED                        1   01600
RDR1      DC     @ @              ANY CARD READER CH 1            1   01601
PRT1           @ @                PRINTER CH 1                    1   01602
PUN1           @  @               PUNCH CH 1                      2   01604
PTR1           @   @              PAPER TAPE CH 1                 3   01607
               @  @                                               2   01609
RDYON2    DCW    @ @              NOT USED                        1   01610
RDR2      DC     @ @              ANY CARD READER CH 2            1   01611
PRT2           @ @                PRINTER CH 2                    1   01612
PUN2           @  @               PUNCH CH 2                      2   01614
PTR2           @   @              PAPER TAPE CH 2                 3   01617
               @  @                                               2   01619

*                LOCATIONS FOR DRIVE NUMBERS ARE BLANK IF THE
*                DRIVES ARE READY AND SET TO THE DRIVE NUMBER
*                WHEN THEY ARE NOT READY

 TDSCH1   DCW    @          @     TAPE DRIVES CHANNEL 1           10  01620
 TDSCH2   DCW    @          @     TAPE DRIVES CHANNEL 2           10  01630

*                STATUS AND AVAILABILITY INDICATORS

CH1SW     DC     @ @              CHANNEL 1 IN USE SWITCH         1   01640
CH2SW     DC     @ @              CHANNEL 2 IN USE SWITCH         1   01641
BUSY1     DC     @ @              CHANNEL 1 BUSY NOT BUSY SWITCH  1   01642
TP1BZY    DC     @ @              TAPE UNIT BUSY CH 1             1   01643
BUSY2     DC     @ @              CHANNEL 2 BUSY NOT BUSY SWITCH  1   01644
TP2BZY    DC     @ @              TAPE UNIT BUSY CH 2             1   01645
```

```
LABEL     OPCOD  OPERAND                  CT  AODRS  INSTRUCTION
*                STEP TO NEXT READY TAPE ORIVE ON A CHANNEL
SETPS1    S      SXRA                     6  01646  S 00074
NEXTP1    A      *-10,ATDNO1              11 01652  A 01652 01766
          MLNS   ATDNO1,SXRA              12 01663  O 01766 00074 1
          BCE    RIPLE1,SXRA,0            12 01675  B 02092 00074 0
          BBE    NEXTP1,TDSCH1&SXRA,M     12 01687  W 01652 010K0 M
                                  G                              G
          MLNS   SXRA,WT1&3               12 01699  D 00074 02673 1
          MLNS   SXRA,WTB1&3              12 01711  D 00074 02780 1
          MLNS   SXRA,BSP1&3              12 01723  D 00074 02880 1
          MLNS   SXRA,RTB1&3              12 01735  D 00074 02975 1
          MLNS   SXRA,SKP1&3              12 01747  D 00074 03025 1
          B      RIPLE1                   7  01759  J 02092
ATDNO1    OCW    @ @                      1  01766
*                *****
SETPS2    S      SXRB                     6  01767  S 00079
NEXTP2    A      *-10,ATDNO2              11 01773  A 01773 01887
          MLNS   ATONO2,SXRB              12 01784  D 01887 00079 1
          BCE    RIPLE2,SXRB,0            12 01796  B 02356 00079 0
          BBE    NEXTP2,TDSCH2&SXRB,M     12 01808  W 01773 010C0 M
                                  G                              G
          MLNS   SXRB,WT2&3               12 01820  D 00079 03127 1
          MLNS   SXRB,WTB2&3              12 01832  D 00079 03234 1
          MLNS   SXRB,BSP2&3              12 01844  D 00079 03334 1
          MLNS   SXRB,RTB2&3              12 01856  D 00079 03429 1
          MLNS   SXRB,SKP2&3              12 01868  D 00079 03479 1
          B      RIPLE2                   7  01880  J 02356
ATONO2    OCW    @ @                      1  01887
```

```
LABEL     OPCOD  OPERAND                                                  CT  ADDRS  INSTRUCTION
**********       START OF TEST
          ORG    2000                                                         02000
START     B      SETUP          INITIALIZATION-DONE 1ST PASS ONLY         7  02000  J 05947
START1    CW     CKECHN&1       SET STARTING ADDRESS OF ROUTINE           6  02007  ¤ 02053
          SAR    X1             IN INDEX REG - CHANNEL 1 ROUTINE          7  02013  G 00029 A
          CW     CKFCHN&1       SET STARTING ADDRESS OF ROUTINE           6  02020  ¤ 02332
          SAR    X2             IN INDEX REG - CHANNEL 2 ROUTINE          7  02026  G 00034 A
          CW     CPURT1&1       START OF CPU ROUTINES                     6  02033  ¤ 03559
          SAR    X3             IN INDEX REG - CPU ROUTINE                7  02039  G 00039 A
          S      CPUCNT         ZERO PASS COUNTER FOR CPU ROUTINE         6  02046  $ 07511
```

```
LABEL     OPCOD  OPERAND                        CT  ADDRS  INSTRUCTION

          CHECK FOR I/O UNITS TO BE TESTED ON CHANNEL 1

CKECHN    BNQ    ALTER          TO PROGRAM ALTER ROUTINE          7  02052  J 01007 Q
          CW     CH1SW          SET CHAN 1 IN USE SWITCH OFF      6  02059  ¤ 01640
ERRSW2    NOPWM                                                   1  02065  N
          B      0&X2           BR IF A CH 2 ERROR IS WAITING     7  02066  J 000'0
          BW     *&8,TP1BZY     DONT STEP TO NEXT DRIVE YET      12  02073  V 02092 01643 1
          B      SETPS1         SET UP FOR THE NEXT TAPE DRIVE    7  02085  J 01646
RIPLE1    MRCG   WAREA1,WAREA1-1 RIPPLE DATA FIELD               12  02092  D 06700 06699 $
          MLCS   WAREA1-1,END1                                   12  02104  D 06699 06831 3

          BCE    PTAPE1,CHN1,1  PAPER TAPE CH 1                  12  02116  B 02606 01289 1
          BCE    TAPEA1,CHN1&2,1 TAPE -MAGNETIC- CH 1  DO A WT   12  02128  B 02663 01291 1
          BBE    READR1,CHN1&12,M ANY CARD READER CH 1           12  02140  W 02713 01301 M
          BCE    TAPEB1,CHN1&2,1 TAPE -MAGNETIC- CH 1  DO A WTB  12  02152  B 02770 01291 1
          BCE    PUNCH1,CHN1&14,P PUNCH CH 1                     12  02164  B 02820 01303 P
          BCE    TAPEC1,CHN1&2,1 TAPE -MAGNETIC- CH 1  DO A BSP  12  02176  B 02870 01291 1
          BCE    PRNTR1,CHN1&16,P PRINTER CH 1                   12  02188  B 02915 01305 P
          BCE    TAPED1,CHN1&2,1 TAPE -MAGNETIC- CH 1  DO A RTB  12  02200  B 02965 01291 1
          BCE    TAPEE1,CHN1&2,1 TAPE -MAGNETIC- CH 1  AN ERASE  12  02212  B 03015 01291 1
          DCW    @N          @   SPARE- FOR MORE ROUTINES        12  02235
          DCW    @N          @   SPARE- FOR MORE ROUTINES        12  02247
          CW     CKECHN&1       SET STARTING ADDRESS OF ROUTINE   6  02248  ¤ 02053
          SAR    X1             IN INDEX REG - CHANNEL 1 ROUTINE  7  02254  G 00029 A

          BCE    CKTAD4,SYS1&7,1 BR IF SYSTEM HAS OVERLAP FEATURE 12  02261  B 02292 01263 1
CKCHN2    BCE    0&X2,SYS1&13,1 GO TO CH 2 ROUTINES IF CH2 ON SYS 12  02273  B 000'0 01269 1
          B      CPURTS         GO TO CPU  ROUTINES               7  02285  J 03514
CKTAD4    BCE    CKCHN2,TAD4,1  BR TO CK ON CH2 IF NOT USING OLAP 12  02292  B 02273 01004 1
          BW     0&X1,CH1SW     BR BACK TO CH1 RT IF CH1 WAS RDY  12  02304  V 000#0 01640 1
BOL21     NOP                                                     1  02316  N
          BOL2   CPURTS         TO CPU ROUTINES                   7  02317  J 03514 2
          B      CKCHN2         GO SEE ABOUT CHANNEL 2            7  02324  J 02273
```

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LABEL    OPCOD  OPERAND                                                CT  ADDRS  INSTRUCTION

                CHECK FOR I/O UNITS TO BE TESTED ON CHANNEL 2

CKFCHN   CW     CH2SW           SET CHAN 2 IN USE SWITCH OFF           6  02331  ¤ 01641
         BW     *&8,TP2BZY      DONT STEP TO NEXT DRIVE YET           12  02337  V 02356 01645 1
         B      SETPS2          SET UP FOR THE NEXT TAPE DRIVE         7  02349  J 01767
RIPLE2   MRCG   WAREA2,WAREA2-1  RIPPLE DATA FIELD                     12  02356  D 06900 06899 $
         MLCS   WAREA2-1,END2                                         12  02368  D 06899 07031 3

         BCE    PTAPE2,CHN2,1    PAPER TAPE CH 2                      12  02380  B 03060 01346 1
         BCE    TAPEA2,CHN2&2,1  TAPE -MAGNETIC- CH 2   DO A WT      12  02392  B 03117 01348 1
         BBE    READR2,CHN2&12,M ANY CARD READER CH 2                 12  02404  W 03167 01358 M
         BCE    TAPEB2,CHN2&2,1  TAPE -MAGNETIC- CH 2   DO A WTB     12  02416  B 03224 01348 1
         BCE    PUNCH2,CHN2&14,P PUNCH CH 2                           12  02428  B 03274 01360 P
         BCE    TAPEC2,CHN2&2,1  TAPE -MAGNETIC- CH 2   DO A BSP     12  02440  B 03324 01348 1
         BCE    PRNTR2,CHN2&16,P PRINTER CH 2                         12  02452  B 03369 01362 P
         BCE    TAPED2,CHN2&2,1  TAPE -MAGNETIC- CH 2   DO A RTB     12  02464  B 03419 01348 1
         BCE    TAPEE2,CHN2&2,1  TAPE -MAGNETIC- CH 2   AN ERASE     12  02476  B 03469 01348 1
         DCW    @N          @    SPARE- FOR MORE ROUTINES             12  02499
         DCW    @N          @    SPARE- FOR MORE RDUTINES             12  02511
         CW     CKFCHN&1         SET STARTING ADDRESS OF RDUTINE       6  02512  ¤ 02332
         SAR    X2               IN INDEX REG - CHANNEL 2 ROUTINE      7  02518  G 00034 A

         BCE    *&8,SYS1&7,1     BRANCH IF OVERLAP ON SYSTEM          12  02525  B 02544 01263 1
         B      CPURTS           TO CPU ROUTINES                       7  02537  J 03514
         BCE    CPURTS,TAD4,1    GO TO CPU RDUTINES IN NOT IN DLAP    12  02544  B 03514 01004 1
         BW     0&X2,CH2SW       BR TO CH2 ROUTINE IF CH2 WAS RDY     12  02556  V 000.0 01641 1
         BOL1   CPURTS           TO CPU ROUTINES                       7  02568  J 03514 1
         BW     CPURTS,BUSY1     TO CPU ROUTINES IF CH 1 WAS BUSY     12  02575  V 03514 01642 1
         BW     0&X1,CH1SW       CH1 RTS IF CH1 WAS READY             12  02587  V 000+0 01640 1
         B      CPURTS           TO CPU ROUTINES                       7  02599  J 03514
```

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LABEL     OPCOD  OPERAND                          CT  ADDRS  INSTRUCTION
*                CHANNEL 1 UNIT TEST ROUTINES
PTAPE1    SBR    X7                STORE ADDR FOR RETURN    7  02606  G 00059 B
          CS     RAREA1&79                                  6  02613  / 07231
          CS                                                1  02619  /
          RPT    1,RAREA1          READ PAPER TAPE          10  02620  M %P0 07152 R
          B      TSTOL1            GO TEST FOR OVERLAP CHAN 1  7  02630  J 03859
          B      CKBA1             GO TEST ALL STATUS INDICATORS 7 02637  J 04269
          MLCS   ABLANK,PTR1                                12  02644  D 05269 01607 3
                                                                       Q
          B      0&X7              RETURN FOR NEXT I/O DEVICE  CH 1  7  02656  J 00*M0

TAPEA1    SBR    X7                STORE ADDRESS FOR RETURN  7  02663  G 00059 B
WT1       WT     11,WAREA1         WRITE EVEN PARITY        10  02670  M %U1 06700 W
          B      TSTOL1            GO TEST FOR OVERLAP CHAN 1  7  02680  J 03859
          B      CKBA1             GO TEST ALL STATUS INDICATORS 7 02687  J 04269
          MLCS   ABLANK,TOSCH1&SXRA SET LOC TO BLANK IF DRIVE READY 12 02694  D 05269 01OK0 3
                                                                       Q
          B      0&X7              RETURN FOR NEXT I/O DEVICE  CH 1  7  02706  J 00*M0

READR1    SBR    X7                STORE ADDR FOR RETURN    7  02713  G 00059 B
          CS     RAREA1&79         CLEAR OUT READ AREA      6  02720  / 07231
          CS                                                1  02726  /
          R      1,RAREA1          READ  A CARD-STACK IN POCKET  1 10 02727  M %11 07152 R
          B      TSTOL1            GO TEST FOR OVERLAP CHAN 1  7  02737  J 03859
          B      CKBA1             GO TEST ALL STAIUS INDICATORS 7 02744  J 04269
          MLCS   ABLANK,RDR1       BLANK OUT POSITION IF READY 12  02751  D 05269 01601 3
                                                                       Q
          B      0&X7              RETURN FOR NEXT I/O DEVICE  CH 1  7  02763  J 00*M0

TAPEB1    SBR    X7                STORE ADDRESS FOR RETURN  7  02770  G 00059 B
WTB1      WTB    11,WAREA1         WRITE TAPE ODD PARITY    10  02777  M %B1 06700 W
          B      TSTOL1            GO TEST FOR OVERLAP CHAN 1  7  02787  J 03859
          B      CKBA1             GO TEST ALL STATUS INDICATORS 7 02794  J 04269
          MLCS   ABLANK,TOSCH1&SXRA SET LOC TO BLANK IF DRIVE READY 12 02801  D 05269 01OK0 3
                                                                       Q
          B      0&X7              RETURN FOR NEXT I/O DEVICE  CH 1  7  02813  J 00*M0
```

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LABEL     OPCOD  OPERAND                    COMMENTS                          CT  ADDRS  INSTRUCTION
PUNCH1    SBR    X7                         STORE ADDR FOR RETURN              7  02820  G 00059 B
          P      4,PAREA1                   PUNCH A CARD-STACK IN POCKET  4   10  02827  M %44 06752 W
          B      TSTOL1                     GO TEST FOR OVERLAP CHAN 1         7  02837  J 03859
          B      CKBA1                      GO TEST ALL STATUS INDICATORS      7  02844  J 04269
          MLCS   ABLANK,PUN1                                                   12  02851  D 05269 01604 3
          B      0&X7                       RETURN FOR NEXT I/O DEVICE  CH 1   7  02863  J 00‡MO

TAPEC1    SBR    X7                         STORE ADDRESS FOR RETURN           7  02870  G 00059 B
BSP1      BSP    11                         BACK SPACE                         5  02877  U %U1 B
          B      TSTOL1                     GO TEST FOR OVERLAP CHAN 1         7  02882  J 03859
          B      CKBA1                      GO TEST ALL STATUS INDICATORS      7  02889  J 04269
          MLCS   ABLANK,TDSCH1&SXRA         SET LOC TO BLANK IF DRIVE READY   12  02896  D 05269 01DK0 3
          B      0&X7                       RETURN FOR NEXT I/O DEVICE  CH 1   7  02908  J 00‡MO

PRNTR1    SBR    X7                         STORE ADDR FOR RETURN              7  02915  G 00059 B
          W      0&WRITE1                   INDEXED FOR 100-132 CHAR BUFFER   10  02922  M %20 00M00 W
          B      TSTOL1                     GO TEST FOR OVERLAP CHAN 1         7  02932  J 03859
          B      CKBA1                      GO TEST ALL STATUS INDICATORS      7  02939  J 04269
          MLCS   ABLANK,PRT1                                                   12  02946  D 05269 01602 3
          B      0&X7                       RETURN FOR NEXT I/O DEVICE  CH 1   7  02958  J 00‡MO

TAPED1    SBR    X7                         STORE ADDRESS FOR RETURN           7  02965  G 00059 B
RTB1      RTB    11,TAREA1                  READ  ODD  PARITY                 10  02972  M %81 07100 R
          B      TSTOL1                     GO TEST FOR OVERLAP CHAN 1         7  02982  J 03859
          B      CKBA1                      GO TEST ALL STATUS INDICATORS      7  02989  J 04269
          MLCS   ABLANK,TDSCH1&SXRA         SET LOC TO BLANK IF DRIVE READY   12  02996  D 05269 01DK0 3
          B      0&X7                       RETURN FOR NEXT I/O DEVICE  CH 1   7  03008  J 00‡MO

TAPEE1    SBR    X7                         STORE ADDRESS FOR RETURN           7  03015  G 00059 B
SKP1      SKP    11                         ERASE/SKIP                         5  03022  U %U1 E
          B      TSTOL1                     GO TEST FOR OVERLAP CHAN 1         7  03027  J 03859
          B      CKBA1                      GO TEST ALL STATUS INDICATORS      7  03034  J 04269
          MLCS   ABLANK,TDSCH1&SXRA         SET LOC TO BLANK IF DRIVE READY   12  03041  D 05269 01DK0 3
          B      0&X7                       RETURN FOR NEXT I/O DEVICE  CH 1   7  03053  J 00‡MO
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LABEL     OPCOD  OPERAND                        CT  ADDRS  INSTRUCTION

*                CHANNEL 2 UNIT TEST ROUTINES

PTAPE2    SBR    X8              STORE ADDR FOR RETURN     7  03060  G 00064 B
          CS     RAREA2&79                                 6  03067  / 07431
          CS                                               1  03073  /
          RPT    2,RAREA2        READ PAPER TAPE          10  03074  M ¤P0 07352 R
          B      TSTOL2          GO TEST FOR OVERLAP CHAN 2  7  03084  J 04059
          B      CKBA2           GO TEST ALL STATUS INDICATORS 7 03091  J 04730
          MLCS   ABLANK,PTR2                              12  03098  D 05269 01617 3
          B      0&X8            RETURN FOR NEXT I/O DEVICE  CH 2  7  03110  J 00.00

TAPEA2    SBR    X8              STORE AODRESS FOR RETURN  7  03117  G 00064 B
WT2       WT     21,WAREA2       WRITE EVEN PARITY        10  03124  M ¤U1 06900 W
          B      TSTOL2          GO TEST FOR OVERLAP CHAN 2  7  03134  J 04059
          B      CKBA2           GO TEST ALL STATUS INDICATORS 7 03141  J 04730
          MLCS   ABLANK,TDSCH2&SXRB SET LOC TO BLANK IF DRIVE READY 12 03148  D 05269 010C0 3
          B      0&X8            RETURN FOR NEXT I/O DEVICE  CH 2  7  03160  J 00.00

READR2    SBR    X8              STORE ADDR FOR RETURN     7  03167  G 00064 B
          CS     RAREA2&79       CLEAR OUT READ AREA       6  03174  / 07431
          CS                                               1  03180  /
        C R2     1,RAREA2        READ A CARD-STACK IN POCKET 1 10 03181  M ¤11 07352 R
          B      TSTOL2          GO TEST FOR OVERLAP CHAN 2  7  03191  J 04059
          B      CKBA2           GO TEST ALL STATUS INDICATORS 7 03198  J 04730
          MLCS   ABLANK,RDR2     BLANK OUT POSITION IF READY 12  03205  D 05269 01611 3
          B      0&X8            RETURN FOR NEXT I/O DEVICE  CH 2  7  03217  J 00.00

TAPEB2    SBR    X8              STORE ADDRESS FOR RETURN  7  03224  G 00064 B
WTB2      WTB    21,WAREA2       WRITE TAPE ODD PARITY    10  03231  M ¤B1 06900 W
          B      TSTOL2          GO TEST FOR OVERLAP CHAN 2  7  03241  J 04059
          B      CKBA2           GO TEST ALL STATUS INDICATORS 7 03248  J 04730
          MLCS   ABLANK,TDSCH2&SXRB SET LOC TO BLANK IF DRIVE READY 12 03255  D 05269 010C0 3
          B      0&X8            RETURN FOR NEXT I/O DEVICE  CH 2  7  03267  J 00.00
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LABEL     OPCOD  OPERAND                    CT  ADDRS  INSTRUCTION
PUNCH2    SBR    X8          STORE ADDR FOR RETURN      7  03274  G 00064 B
      C   P2     4,PAREA2    PUNCH A CARD-STACK IN POCKET 4  10  03281  M ¤44 06952 W
          B      TSTOL2      GO TEST FOR OVERLAP CHAN 2     7  03291  J 04059
          B      CK8A2       GO TEST ALL STATUS INDICATORS  7  03298  J 04730
          MLCS   ABLANK,PUN2                               12  03305  D 05269 01614 3
          B      0&X8        RETURN FOR NEXT I/O DEVICE  CH 2  7  03317  J 00.00

TAPEC2    SBR    X8          STORE ADDRESS FOR RETURN       7  03324  G 00064 B
BSP2      BSP    21          BACK SPACE                     5  03331  U ¤U1 B
          B      TSTOL2      GO TEST FOR OVERLAP CHAN 2     7  03336  J 04059
          B      CK8A2       GO TEST ALL STATUS INDICATORS  7  03343  J 04730
          MLCS   ABLANK,TDSCH2&SXRB SET LOC TO BLANK IF DRIVE READY  12  03350  D 05269 010C0 3
          B      0&X8        RETURN FOR NEXT I/O DEVICE  CH 2  7  03362  J 00.00

PRNTR2    SBR    X8          STORE ADOR FOR RETURN          7  03369  G 00064 B
          W2     0&WRITE2    INDEXED FOR 100-132 CHAR BUFFER  10  03376  M ¤20 00M¢0 W
                                                                        Q
          B      TSTOL2      GO TEST FOR OVERLAP CHAN 2     7  03386  J 04059
          B      CK8A2       GO TEST ALL STATUS INDICATORS  7  03393  J 04730
          MLCS   ABLANK,PRT2                               12  03400  D 05269 01612 3
          B      0&X8        RETURN FOR NEXT I/O DEVICE  CH 2  7  03412  J 00.00

TAPED2    SBR    X8          STORE AOORESS FOR RETURN       7  03419  G 00064 B
RT82      RTB    21,TAREA2   READ  OOD  PARITY             10  03426  M ¤B1 07300 R
          B      TSTOL2      GO TEST FOR OVERLAP CHAN 2     7  03436  J 04059
          B      CK8A2       GO TEST ALL STATUS INDICATORS  7  03443  J 04730
          MLCS   ABLANK,TDSCH2&SXRB SET LOC TO BLANK IF DRIVE READY  12  03450  D 05269 010C0 3
          B      0&X8        RETURN FOR NEXT I/O DEVICE  CH 2  7  03462  J 00.00

TAPEE2    SBR    X8          STORE ADDRESS FOR RETURN       7  03469  G 00064 B
SKP2      SKP    21          ERASE/SKIP                     5  03476  U ¤U1 E
          B      TSTOL2      GO TEST FOR OVERLAP CHAN 2     7  03481  J 04059
          B      CK8A2       GO TEST ALL STATUS INOICATORS  7  03488  J 04730
          MLCS   ABLANK,TDSCH2&SXRB SET LOC TO BLANK IF DRIVE READY  12  03495  0 05269 010C0 3
          B      0&X8        RETURN FOR NEXT I/O DEVICE  CH 2  7  03507  J 00.00
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```
LABEL     OPCOD  OPERAND                                                CT  ADDRS  INSTRUCTION
*                THIS IS THE ONLY ENTRY TO THE CPU ROUTINE SERIES
CPURTS    BCE    0&X3,TAD5,1          GO TO CPU ROUTINES NO PRIORITY    12  03514  B 000@0 01005 1
          ZA     STOREO               RESTORE CPU STATUS BEFORE RETURN   6  03526  M 05946
          C      STORLO-1,STOREQ                                        11  03532  C 05943 05945
BEPASW    NOP                                                            1  03543  N
          BEPA   0&X3                 ENTER ALERT MODE AND GO TO CPU RT  7  03544  Y 000@0 E
          B      0&X3                 TO CPU ROUTINES                    7  03551  J 000@0
*                CPU ROUTINES
CPURT1    MLCA   MULT1,MULFLD-17                                        12  03558  D 07527 07592 T
          M      MULT2,MULFLD         MULTIPLY                         11  03570  @ 07543 07609
          C      MULFLD,PRODCT                                         11  03581  C 07609 07576
          BE     *&2                                                    7  03592  J 03600 S
          H                                                             1  03599  .
          B      CKCHNS               GO SEE HOW THE CHANNELS ARE DOING  7  03600  J 05590
          ZA     DIV1,MULFLD-2        SET UP DATA FIELD                11  03607  M 07629 07607
          D      DIV2,MULFLD-21       DIVIDE                           11  03618  % 07639 07588
          C      MULFLD-2,DIV3                                         11  03629  C 07607 07670
          BE     *&2                                                    7  03640  J 03648 S
          H                                                             1  03647  .
          B      CKCHNS               GO SEE HOW THE CHANNELS ARE DOING  7  03648  J 05590
          MLCWA  @ *$0@,CTLFLO        SET UP EDIT                      12  03655  D 07688 07679 X
          MCE    @6.0@,CTLFLD         EDIT                             11  03667  E 07691 07679
          SBR    BAR                                                    7  03678  G 07675 B
          C      BAR,BAROK            CHECK ON ADDR AT END OF EDIT     11  03685  C 07675 07684
          BU     *&19                 SHOULD BE EQUAL                   7  03696  J 03721 /
          C      CTLFLD,@$6.0@                                         11  03703  C 07679 07695
          BE     *&2                                                    7  03714  J 03722 S
          H                                                             1  03721  .
```

```
LABEL     OPCOD  OPERAND                        CT  ADDRS  INSTRUCTION
BXPA2     NOP                                    1  03722  N
          BXPA   *&1              EXIT PRIORITY ALERT MODE  7  03723  Y 03730 X
          CW     CPURT1&1         START OF CPU ROUTINES     6  03730  ¤ 03559
          SAR    X3               IN INDEX REG - CPU ROUTINE 7 03736  G 00039 A
ONEPAS    A      *-10,CPUCNT      ADD 1 TO CPU COUNTER     11  03743  A 03743 07511
          BCE    TYPASS,CPUCNT-3,1                         12  03754  B 03820 07508 1
          BCE    *&13,TAD4,1      BR TO ADD  IF NOT USING OVERLAP 12 03766 B 03790 01004 1
          BCE    CPURTS,SYS1&7,1  BR IF OVERLAP ON SYSTEM   12  03778  B 03514 01263 1
          A      *&1,CPUCNT       ADD TWO                  11  03790  A 03801 07511
          BCE    TYPASS,CPUCNT-3,1                         12  03801  B 03820 07508 1
          B      O&X1             BR BACK TO CHANNEL 1 ROUTINES 7 03813 J 000#0

*                TYPE PASS AND CHECK FOR EOJ

TYPASS    B      TYP                                       7  03820  J 01514
          DCW    @PASS@,G                                  4  03830
BA2SW2    NOP                                              1  03832  N
          BA2    *&1              RESET CH 2 INTERLOCK      7  03833  X 03840 GM
          BCE    START1,TAD3,1    REPEAT TEST              12  03840  B 02007 01003 1
          B      LOADER           CALL IN NEXT PROGRAM      7  03852  J 00400
*                                 *****
```

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LABEL      OPCOD  OPERAND                          CT  ADDRS  INSTRUCTION

*                 TEST FOR OVERLAP ON CHANNEL 1

TSTOL1     SBR    X1              STORE AODR FOR RETURN     7  03859  G 00029 B
BOL11   C  NOP                                      1  03866  N
        C  BOL1   CH1OIP          CONTINUE OVERLAP ROUTINES 7  03867  J 03996 1
        C  MLNA   X1,X4           SAVE AOORESS             12  03874  D 00029 00044 /
           S      TWELVE,X4       SUB FOR ADOR OF I/O OP COOE 11 03886  S 07503 00044
           BCE    0&X1,0&X4,U     LEAVE IF IT WAS A UNIT CONTROL OP 12 03897 B 000#0 00#00 U
           S      FIVE,X4         SUB FOR ADOR OF I/O OP CODE 11 03909  S 07512 00044
           BCE    0&X1,TA04,1     BACK TO CH 1 IF NOT USING OVERLAP 12 03920 B 000#0 01004 1
OLSW1   C  NOPWM                                    1  03932  N
        C  B      0&X1            BR TO CHAN 1 ROUTINES IF NO OLAP 7 03933 J 000#0
           BA1    0&X1            RETURN TO CHANNEL 1 ROUTINE 7 03940 R 000#0 G M
           MLCA   9&X4,OLOP1      SET INSTRUCTION IN ERROR MESSAGE 12 03947 0 00#09 03987 T
           B      TYP1                                 7  03959  J 05489
        C  OCW    @NO BOL AFTR @  FAILEO TO BR ON OLAP IN PROCESS 12 03977
OLOP1      OCW    @         @,G   INSTRUCTION ISSUED       10  03987
           B      0&X1            BR BACK TO CHANNEL 1 ROUTINES 7 03989 J 000#0

CH1OIP     SW     CH1SW           SET CHAN 1 IN USE SWITCH ON 6 03996 , 01640
        C  MLNA   X1,X4           SAVE AOORESS             12  04002  D 00029 00044 /
           S      @17@,X4         SUB FOR ADDR OF I/O OP COOE 11 04014 S 07697 00044
CH2BR1  C  NOPWM                                    1  04025  N
        C  B      CPURTS          BR ON IF CHAN 2 NOT AVAILABLE 7 04026 J 03514
           BOL2   CPURTS          TO CPU ROUTINES          7  04033  J 03514 2
           B      0&X2            BR BACK TO CHANNEL 2 ROUTINES 7 04040 J 000.0
        C  OCW    @N          @   FILLER                   12  04058
```

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LABEL     OPCOD  OPERAND                          CT  ADDRS  INSTRUCTION

*                TEST FOR OVERLAP ON CHANNEL 2

TSTOL2    SBR    X2              STORE ADDR FOR RETURN     7  04059  G 00034 8
BOL22  C  NOP                                      1  04066  N
       C  BOL2   CH2OIP          CONTINUE OVERLAP ROUTINES 7  04067  J 04214 2
       C  MLNA   X2,X5           SAVE ADDRESS             12  04074  D 00034 00049 /
          S      TWELVE,X5       SUB FOR ADDR OF I/O OP CODE 11 04086  S 07503 00049
          BCE    0&X2,0&X5,U     LEAVE IF IT WAS A UNIT CONTROL OP 12 04097 B 000'0 00##0 U
          S      FIVE,X5         SUB FOR ADDR OF I/O OP CODE 11 04109  S 07512 00049
          BCE    0&X2,TAD4,1     BACK TO CH 2 IF NOT USING OVERLAP 12 04120 B 000'0 01004 1
OLSW2  C  NOPWM                                    1  04132  N
       C  B      0&X2            BR TO CH 2 ROUTINES IF NO OLAP 7 04133 J 000'0
          BA2    0&X2            RETURN TO CHANNEL 2 ROUTINE  7  04140  X 000'0 G M
          MLCA   9&X5,OLOP2      SET INSTRUCTION IN ERROR MESSAGE 12 04147 D 00##9 04205 T
          BW     ERRON2,CH1SW    CH 2 ERR BUT CH 1 IN USE    12  04159  V 05214 01640 1
          CW     ERRSW2&1        CLEAR CH 2 ERROR PENDING SWITCH 6 04171 ¤ 02066
          B      TYP1                                       7  04177  J 05489
       C  DCW    aNO BOL AFTR a  FAILED TO BR ON OLAP IN PROCESS 12 04195
OLOP2     DCW    a          a,G  INSTRUCTION ISSUED         10  04205
          B      0&X2            BR BACK TO CHANNEL 2 ROUTINES 7 04207 J 000'0

CH2OIP    SW     CH2SW           SET CHAN 1 IN USE SWITCH ON  6  04214  , 01641
       C  MLNA   X2,X5           SAVE ADDRESS             12  04220  D 00034 00049 /
          S      a17a,X5         SUB FOR ADDR OF I/O OP CODE 11 04232  S 07697 00049
          BOL1   CPURTS          TO CPU ROUTINES           7  04243  J 03514 1
          B      0&X1            BR BACK TO CHANNEL 1 ROUTINES 7 04250 J 000#0
       C  DCW    aN         a    FILLER                   12  04268
```

```
LABEL     OPCOD  OPERAND                                                CT  ADDRS  INSTRUCTION
*                TEST CHANNEL STATUS INDICATORS FOR EACH I/O UNIT
*                SAVE NOT READY AND BUSY INDICATIONS
*                PREPARE ERROR MESSAGE FOR TYPEOUT
*                                  CHANNEL 1
CKBA1     SBR    X1                 STORE ADDR FOR RETURN               7  04269  G 00029 8
          BNR1   CK4NR1             CHECK FURTHER IF NOT READY          7  04276  R 04539 1
          BC81   BZYON1             UNIT BUSY                           7  04283  R 04649 2
          SW     CH1SW              CHAN 1 READY - NOT READY SWITCH     6  04290  ¤ 01640
NOBZY1    CW     BUSY1              NO LONGER BUSY                      6  04296  ¤ 01642
          CW     TP1BZY             SET TAPE UNIT NOT BUSY SWITCH       6  04302  ¤ 01643
          BA1    *&8                                                    7  04308  R 04322 G H
          B      O&X1                                                   7  04315  J C00+0
          MLCA   BLANKS,WHAT        BLANK RIGHT HALF OF ERROR MESSAGE  12  04322  D 07501 05268 T
          MLCA   4&X4,WHAT-5        SET I/O INSTRUCTION IN ERROR MSGE  12  04334  D 00+04 05263 T
          BZN    *&13,4&X4,&        BR IF OP WAS BSP OR ERASE          12  04346  V 04370 00+04 8
          MLCA   9&X4,WHAT          SET I/O INSTRUCTION IN ERROR MSGE  12  04358  D 00+09 05268 T
          MLCS   CKBA1&7,BSP&5      SET OP CODE                        12  04370  D 04276 05432 3
          MLCS   CKBA1&7,SKP&5                                         12  04382  D 04276 05444 3
          MLCS   CKBA1&7,RWD&5                                         12  04394  D 04276 05475 3
          MLCA   ALLIND,INDSET      SET ALL STATUS INDICATORS IN MSGE  12  04406  D 07507 05276 T
          BNR1   *&13               NOT READY                          7  04418  R 04437 1
          MLCS   ABLANK,INDSET-5                                       12  04425  D 05269 05271 3
          BC81   *&13               BUSY                               7  04437  R 04456 2
          MLCS   ABLANK,INDSET-4                                       12  04444  D 05269 05272 3
          BER1   *&13               DATA CHECK                         7  04456  R 04475 4
          MLCS   ABLANK,INDSET-3                                       12  04463  D 05269 05273 3
          BEF1   *&13               CONDITION                          7  04475  R 04494 8
          MLCS   ABLANK,INDSET-2                                       12  04482  D 05269 05274 3
          BWL1   *&13               WRONG LENGTH RECORD                7  04494  R 04513 -
          MLCS   ABLANK,INDSET-1                                       12  04501  D 05269 05275 3
          BNT1   *&13               NO TRANSFER                        7  04513  R 04532 S 8
          MLCS   ABLANK,INDSET                                         12  04520  D 05269 05276 3
          B      ERRORT             TO ERROR ROUTINE                   7  04532  J 05238
```

```
LABEL     OPCOD  OPERAND                                                CT  ADDRS  INSTRUCTION
*                NOT READY ROUTINE- CHANNEL 1

CK4NR1    BCE    TAPES1,2&X4,B          TAPE CH 1                       12  04539  B 04606 00+02 B
          BCE    TAPES1,2&X4,U                                          12  04551  B 04606 00+02 U
          MLCS   2&X4,SXRC              SET UNIT SEL CHAR IN INDEX REG  12  04563  D 00+02 00094 3
          BBE    0&X7,RDYON1&SXRC,M     THAT UNIT WAS NOT READY LAST TIME 12 04575  W 00+M0 01F!0 M
          MLCS   2&X4,RDYON1&SXRC       SET UNIT NOT READY NOW          12  04587  D 00+02 01F!0 3
          B      NOBZY1                 RETURN TO TEST REST OF STATUS IND  7  04599  J 04296

TAPES1    MLCS   3&X4,SXRA              SET TAPE DRIVE NO IN INDEX REG  12  04606  D 00+03 00074 3
          BBE    0&X7,TDSCH1&SXRA,M     THAT UNIT WAS NOT READY BEFORE  12  04618  W 00+M0 010K0 M
          MLNS   3&X4,TDSCH1&SXRA       SET TO NO NOT READY NOW         12  04630  D 00+03 010K0 1
          B      NOBZY1                 RETURN TO TEST REST OF STATUS IND  7  04642  J 04296

BZYON1    BCE    TPBZY1,2&X4,B          TAPE UNIT BUSY                  12  04649  B 04686 00+02 B
          BCE    TPBZY1,2&X4,U                                          12  04661  B 04686 00+02 U
          SW     BUSY1                  UNIT BUSY - NOT TAPE             6  04673  , 01642
          B      DOVER1                                                  7  04679  J 04692
TPBZY1    SW     TP1BZY                 SET TAPE UNIT BUSY SWITCH        6  04686  , 01643
DOVER1    MLNA   X4,X1                  SET ADDR OF I/O INST IN CH 1 RT  12  04692  D 00044 00029 /
          BCE    CPURTS,SYS1&13,        BR IF NO CHAN 2 ON SYSTEM       12  04704  B 03514 01269
          BOL2   CPURTS                 TO CPU ROUTINES                  7  04716  J 03514 2
          B      0&X2                   TO CHANNEL 2 ROUTINES            7  04723  J 000!0
```

```
LABEL     OPCOD  OPERAND                    CT  ADDRS  INSTRUCTION
*                TEST CHANNEL STATUS INDICATORS FOR EACH I/O UNIT
*                SAVE NOT READY AND BUSY INDICATIONS
*                PREPARE ERROR MESSAGE FOR TYPEOUT
*                                CHANNEL 2

CKBA2     SBR    X2             STORE AODR FOR RETURN        7  04730  G 00034 B
          BNR2   CK4NR2         CHECK FURTHER IF NOT READY   7  04737  X 05018 1
          BCB2   BZYON2         UNIT BUSY                    7  04744  X 05152 2
          SW     CH2SW          CHAN 2 READY - NOT READY SWITCH 6 04751  , 01641
        C CW     BUSY2          NO LONGER BUSY               6  04757  ¤ 01644
          CW     TP2BZY         SET TAPE UNIT NOT BUSY SWITCH 6 04763  ¤ 01645
                                                             7  04769  X 04783 GM
THEBA2  C BA2    *&8                                         7  04776  J 000.0
          B      0&X2           BR TO CH2

          BW     ERRON2,CH1SW   CH 2 ERR BUT CH 1 IN USE     12 04783  V 05214 01640 1
          CW     ERRSW2&1       CLEAR CH 2 ERROR PENDING SWITCH 6 04795 ¤ 02066
          MLCA   BLANKS,WHAT    BLANK RIGHT HALF OF ERROR MSGE 12 04801  D 07501 05268 T
          MLCA   4&X5,WHAT-5    SET I/O INSTRUCTION IN ERROR MSGE 12 04813 D 00‡‡4 05263 T
          BZN    *&13,4&X5,&    BR IF OP WAS BSP OR ERASE    12 04825  V 04849 00‡‡4 B
          MLCA   9&X5,WHAT      SET I/O INSTRUCTION IN ERROR MSGE 12 04837 D 00‡‡9 05268 T
          MLCS   CKBA2&7,BSP&5  SET OP CODE                  12 04849  D 04737 05432 3
          MLCS   CKBA2&7,SKP&5                               12 04861  D 04737 05444 3
          MLCS   CKBA2&7,RWD&5                               12 04873  D 04737 05475 3
          MLCA   ALLIND,INDSET  SET ALL STATUS INDICATORS IN MSGE 12 04885 D 07507 05276 T
          BNR2   *&13           NOT READY                    7  04897  X 04916 1
          MLCS   ABLANK,INDSET-5                             12 04904  D 05269 05271 3
          BCB2   *&13           BUSY                         7  04916  X 04935 2
          MLCS   ABLANK,INDSET-4                             12 04923  D 05269 05272 3
          BER2   *&13           DATA CHECK                   7  04935  X 04954 4
          MLCS   ABLANK,INDSET-3                             12 04942  D 05269 05273 3
          BEF2   *&13           CONDITION                    7  04954  X 04973 8
          MLCS   ABLANK,INDSET-2                             12 04961  D 05269 05274 3
          BWL2   *&13           WRONG LENGTH RECORD          7  04973  X 04992 -
          MLCS   ABLANK,INDSET-1                             12 04980  D 05269 05275 3S
          BNT2   *&13           NO TRANSFER                  7  04992  X 05011 B
          MLCS   ABLANK,INDSET                               12 04999  D 05269 05276 3
          B      ERRORT         TO ERROR ROUTINE             7  05011  J 05238
```

```
LABEL     OPCOD  OPERAND                        CT  ADORS  INSTRUCTION

*                NOT READY ROUTINE- CHANNEL 2

CK4NR2    BCE    TAPES2,2&X5,B      TAPE CH 2   12  05018  B 05097 00**2 B
          BCE    TAPES2,2&X5,U                  12  05030  B 05097 00**2 U
          MLCS   2&X5,SXR0          SET UNIT SEL CHAR IN INDEX REG  12  05042  D 00**2 00099 3
          BBE    0&X8,RDYON2&SXRD,M THAT UNIT WAS NOT READY LAST TIME  12  05054  W 00'00 01FA0 M
        C BW     *&13,CH1SW         DONT MARK IT YET-CHAN 1 IN USE  12  05066  V 05090 01640 1
          MLCS   2&X5,RDYON2&SXR0   SET UNIT NOT READY NOW  12  05078  O 00**2 01FA0 3
        C B      THEBA2             RETURN TO TEST REST OF STATUS IN0  7  05090  J 04769

TAPES2    MLCS   3&X5,SXRB          SET TAPE DRIVE NO IN INDEX REG  12  05097  O 00**3 00079 3
          BBE    0&X8,TOSCH2&SXRB,M THAT UNIT WAS NOT READY BEFORE  12  05109  W 00'00 010C0 M
          BW     *&13,CH1SW         DONT MARK IT YET IF CH 1 IN USE  12  05121  V 05145 01640 1
          MLNS   3&X5,TOSCH2&SXRB   SET TO NO NOT READY NOW  12  05133  D 00**3 010C0 1
        C B      THEBA2             RETURN TO TEST REST OF STATUS IND  7  05145  J 04769

BZYON2    BCE    TPBZY2,2&X5,B                  12  05152  B 05189 00**2 B
          BCE    TPBZY2,2&X5,U                  12  05164  B 05189 00**2 U
          SW     BUSY2              UNIT BUSY - NOT TAPE  6  05176  , 01644
          B      DOVER2                         7  05182  J 05195
TPBZY2    SW     TP2BZY             SET TAPE UNIT BUSY SWITCH  6  05189  , 01645
DOVER2    MLNA   X5,X2              SET ADDR OF I/O INST IN CH 2 RT  12  05195  O 00049 00034 /
          B      CPURTS             TO CPU ROUTINES  7  05207  J 03514

ERRON2    SW     ERRSW2&1           SET CHAN 2 ERROR PENDING SWITCH  6  05214  , 02066
          S      @7@,X2             COME BACK AGAIN NEXT TIME  11  05220  S 07698 00034
          B      0&X1                           7  05231  J 000*0
```

LABEL	OPCOD	OPERAND		CT	ADDRS	INSTRUCTION
*		COMMON ERROR ROUTINE FOR BOTH CHANNELS				
*		CHECK TADS FOR TYPING - HALT ON ERROR				
[illegible]	BCS	CR4HLT,TAD0,1	BR IF NOT TYPING	12	05238	B 05270 01000 1
	B	TYP		7	05250	J 01514
	DCW	=W 8	* INDICATES ERROR MESSAGE	2	05250	
		2 0	FAILING INSTRUCTION - OP CODE	1	05259	
		3 2	X CONTROL FIELD	3	05262	
[illegible]		3 3	B ADDRESS AND D MODIFIER	6	05268	
ABLANK		2 @		1	05269	
		@ @		1	05270	
INDSET	DCW	@ @,G	STATUS INDICATOR SET	6	05276	
CR4HLT	BCE	*&8,TAD2,1	BR IF HALT ON ERROR IS ON	12	05278	B 05297 01002 1
	B	*&2	BR IF HALT ON ERROR IS NOT ON	7	05290	J 05298
	H		STOP ON ERROR	1	05297	.
	BCE	NRDYXT,INDSET-5,1	USE ANOTHER RETURN IF NOT READY	12	05298	B 05384 05271 1
	BCE	TAPEOP,WHAT-7,B		12	05310	B 05341 05261 B
	BCE	TAPEOP,WHAT-7,U		12	05322	B 05341 05261 U
	B	ERRXIT		7	05334	J 05365
TAPEOP	BCE	BSPSKP,INDSET-3,4	DATA CHECK ERROR	12	05341	B 05403 05273 4
	BCE	REWIND,INDSET-2,8	END OF FILE	12	05353	B 05458 05274 8
ERRXIT	BBE	O&X2,WHAT-8,-	RETURN TO CHANNEL 2 ROUTINES	12	05365	W 000.0 05260 -
	B	O&X1	RETURN TO CHANNEL 1 ROUTINES	7	05377	J 000+0
NRDYXT	BBE	O&X8,WHAT-8,-	RETURN TO NEXT ROUTINE ON NOT RDY	12	05384	W 00.00 05260 -
	B	O&X7		7	05396	J 00+M0

```
LABEL     OPCOD  OPERAND                    CT  ADDRS  INSTRUCTION
BSPSKP    MLCA   WHAT-6,BSP&3               12  05403  D 05262 05430 T
          MLCA   WHAT-6,SKP&3               12  05415  D 05262 05442 T
BSP       BSP    10                         5  05427  U %U0 B
          BAI    *-11                       7  05432  R 05427 GM
SKP       SKP    10                         5  05439  U %U0 E
          BAI    *-11                       7  05444  R 05439 GM
          B      ERRXIT                     7  05451  J 05365

REWIND    MLCA   WHAT-6,RWD&3               12  05458  D 05262 05473 T
RWD       RWD    10                         5  05470  U %U0 R
          BAI    *-11                       7  05475  R 05470 GM
          B      ERRXIT                     7  05482  J 05365

          TYPING ROUTINE  TYP1

TYP1      SBR    TYP2&5                     7  05489  G 05508 B
          SBR    TYP3&8                     7  05496  G 05549 B
TYP2      SCNRG  0,0                       12  05503  D 00000 00000 Q
          SAR    TYP4&5                     7  05515  G 05582 A
          BCE    TYP4,TAD0,1               12  05522  B 05577 01000 1
          BAI    *&1                        7  05534  R 05541 GM
TYP3      WCP    0                         10  05541  M %T0 00000 W
          BCB1   TYP3                       7  05551  R 05541 2
          BAI    *&1                        7  05558  R 05565 GM
          BCE    *&8,TAD2,1                12  05565  B 05584 01002 1
TYP4      B      0                          7  05577  J 00000
          H      *-12                       6  05584  . 05577
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```
LABEL     OPCOD  OPERAND                                              CT  ADDRS  INSTRUCTION

*                CHECK ON CHANNEL OPERATION IN BETWEEN EACH CPU
*                SUBROUTINE. KEEP CHANNELS IN OPERATION.

CKCHNS    SBR    X6                 ADDR OF RETURN TO NEXT CPU RT     7  05590  G 00054 B
          BCE    CPUOUT,TAD4,1      BR IF NOT USING OVERLAP          12  05597  B 05720 01004 1
          BCE    CPUOUT,SYS1&7,     BR IF OVERLAP NOT ON SYSTEM      12  05609  B 05720 01263
          BCE    CKONOL,TAD5,1      BR IF NOT USING PRIORITY         12  05621  B 05713 01005 1
          BCE    CKONOL,SYS1&8,     BR IF PRIORITY NOT ON SYSTEM     12  05633  B 05713 01264
CKBZY1    SW     BEPASW&1           RESET SWITCH FOR ALERT MODE       6  05645  , 03544
          BW     CPUOUT,BUSY1       LEAVE IF CHAN 1 WAS BUSY         12  05651  V 05720 01642 1
          BW     CPUOUT,TP1BZY      LEAVE IF CH 1 TAPE WAS BUSY      12  05663  V 05720 01643 1
          BW     CPUEND,BUSY2       LEAVE IF CHAN 2 WAS BUSY         12  05675  V 05749 01644 1
          BW     CPUEND,TP2BZY      LEAVE IF CH 2 TAPE WAS BUSY      12  05687  V 05749 01645 1
          BNQ    CPUOUT             LEAVE ON INQUIRY BY WAY OF CPUXIT 7  05699  J 05720 Q
          B      O&X6               BACK TO CPU ROUTINES              7  05706  J 00*.0

CKONOL C  BOL1   CH2BR2                                               7  05713  J 05734 1
CPUOUT    B      CPUXIT             TO CPU EXIT ROUTINE               7  05720  J 05763
          B      O&X1               BR BACK TO CHANNEL 1 ROUTINES     7  05727  J 000*0

CH2BR2 C  NOPWM                                                       1  05734  N
       C  B      CPUOUT             BR IF CHAN 2 NOT AVAILABLE        7  05735  J 05720
          BOL2   O&X6               RETURN TO CPU ROUTINES            7  05742  J 00*.0 2
CPUEND    B      CPUXIT             LEAVE BY WAY OF CPU EXIT          7  05749  J 05763
          B      O&X2               BR BACK TO CHANNEL 2 ROUTINES     7  05756  J 000.0

CPUXIT    SBR    CPUOVR&5                                             7  05763  G 05795 B
BXPA1     NOP                                                         1  05770  N
          BXPA   *&1                EXIT PRIORITY ALERT MODE          7  05771  Y 05778 X
          MLNA   X6,X3              SET CPU RT EXIT IN CPU RT INDXREG 12  05778  D 00054 00039 /
CPUOVR    B      0                  RETURN FROM WHENCE YOU CAME       7  05790  J 00000
```

```
LABEL     OPCOD  OPERAND                                                CT  ADDRS  INSTRUCTION
INTRPT    SBR    X3          STORE ADDR OF INTERRUPT                     7  05797  G 00039 B
          B      PRIORT      GO TO PRIORITY ROUTINE                      7  05804  J 05812
          DCW    a@a         INTERRUPT ROUTINE IS MOVED TO 101           1  05811
                 G

*                 PRIORITY ROUTINE

PRIORT    SW     STOREO      TEST AND STORE CPU STATUS                   6  05812  , 05946
          SW                                                             1  05818  ,
          SW                                                             1  05819  ,
          BZ     *&7         BR IF ZERO BALANCE IS ON                    7  05820  J 05833 V
          CW     STOREO                                                  6  05827  ¤ 05946
          BE     TSTINT      BR IF EQUAL INDUCATOR IS ON                 7  05833  J 05859 S
          CW     STOREQ                                                  6  05840  ¤ 05945
          BL     TSTINT      BR IF LOW  INDUCATOR IS ON                  7  05846  J 05859 T
          CW     STORLO                                                  6  05853  ¤ 05944
TSTINT    S      a6a,X3      SET X3 BACK TO START OF OPERATION           11 05859  S 07699 00039
          BOPR1  0&X1        BACK TO CH 1 ROUTINE                        7  05870  Y 000+0 1
          BUPR1  0&X1        BACK TO CH 1 ROUTINE                        7  05877  Y 000+0 U
BOPR2     NOP                                                            1  05884  N
          BOPR2  0&X2        BACK TO CH 2 ROUTINE                        7  05885  Y 000.0 2
BUPR2     NOPWM                                                          1  05892  N
          BUPR2  0&X2        BACK TO CH 2 ROUTINE                        7  05893  Y 000.0 F
          BIPR   INTXIT      BRANCH ON AN INQUIRY PRIORITY REQ           7  05900  Y 05929 Q
          BA1    *&1         RESET CHANNEL 1 INTERLOCK                   7  05907  R 05914 GM
BA2SW3    NOP                                                            1  05914  N
          BA2    *&1         RESET CHANNEL 2 INTERLOCK                   7  05915  X 05922 GM
          B      INTERR      UNKNOWN INTERRUPT                           7  05922  J 01115

INTXIT    CW     BEPASW&1    DONT  ENTER CPU ROUTINES IN ALERT           6  05929  ¤ 03544
          B      CPURTS      TO CPU ROUTINES                             7  05935  J 03514

          DCW    a11a                                                    2  05943
STORLO           a0a                                                    1  05944
STOREQ           a1a                                                    1  05945
STOREO           a0a                                                    1  05946
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LABEL     OPCOD  OPERAND                                  CT  ADDRS  INSTRUCTION

                 INITIALIZATION-DONE 1ST PASS ONLY

SETUP     CS     199                                       6  05947  / 00199
          CS                          DOWN TO 0            1  05953  /
          MRCW   START,1              SET UP RESET RESTART BRANCH  12  05954  D 02000 00001 TM
          MRCW                                             1  05966  D
          SW     X1-4,X15-4           SET WMS IN INDEX REGS  11  05967  , 00025 00095
          MLWB   X15-4,X14-4           ALL THE WAY         12  05978  D 00095 00090 M
          B      TYP                                       7  05990  J 01514
        C DCW    @ST03C@,G                                 5  06001
          MLCA   COLSEQ,END1          LOAD COL SEQ INTO WRITE WORK AREA  12  06003  D 07496 06831 T
          MLCB   END1,END1-64         FILL IT UP          12  06015  D 06831 06767 L
          MLCA   COLSEQ,END2          LOAD COL SEQ INTO WRITE WORK AREA  12  06027  D 07496 07031 T
          MLCB   END2,END2-64         FILL IT UP          12  06039  D 07031 06967 L
          CW     WAREA1&1                                  6  06051  ¤ 06701
          SAR    WRITE1               INDEX REG- ADDR OF PRINT AREA 1  7  06057  G 00084 A
          BCE    *&14,SYS1&3,2        CHECK FOR 132 CHARACTER BUFFER  12  06064  B 06089 01259 2
          CW     WAREA1&33                                 6  06076  ¤ 06733
          SAR    WRITE1               INDEX REG- ADDR OF PRINT AREA1  7  06082  G 00084 A
          CW     WAREA2&1                                  6  06089  ¤ 06901
          SAR    WRITE2                                    7  06095  G 00089 A
          BCE    *&14,SYS1&4,2        CHECK FOR 132 CHARACTER BUFFER  12  06102  B 06127 01260 2
          CW     WAREA2&33                                 6  06114  ¤ 06933
          SAR    WRITE2                                    7  06120  G 00089 A
          MRCWG  INTRPT,101           SET UP INTERRUPT ROUTINE  12  06127  D 05797 00101 DL
        C BCE    DUMYR2,SYS1&13,1     BR IF CHAN 2 AVAILABLE  12  06139  B 06186 01269 1
          CW     BA2SW1&1,BA2SW2&1    BA2 SAFE TO ISSUE   11  06151  ¤ 01015 03833
          CW     BA2SW3&1                                  6  06162  ¤ 05915
        C SW     CH2BR1&1,CH2BR2&1    TURN ON  BR TO CH 2 ROUTINES  11  06168  , 04026 05735
        C B      CK40L                                     7  06179  J 06221
DUMYR2    R2     0,RAREA2             DUMMY READ TO TURN OFF READER EOF  10  06186  M ¤10 07352 R
          BA2    *&1                                       7  06196  X 06203 MG
          BCE    *&7,SYS1&9,          CHECK FOR PRIORITY EXT FEATURE  12  06203  B 06221 01265
          SW     BUPR2&1              CH 2 UNIT RECORD INTERRUPT  6  06215  , 05893
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LABEL      OPCOD  OPERAND                                                CT  ADDRS  INSTRUCTION
CK4OL  C   BCE    CK4PRI,SYS1&7,1     BR TO CK FOR PRI IF OVERLAP AVAIL  12  06221  B 06266 01263 1
           CW     BOL21&1,BOPR2&1     DO NOT USE INSTRUCTIONS            11  06233  ¤ 02317 05885
       C   CW     BOL11&1,BOL22&1     SET CHAN 1 & CHAN 2 BR OLAP OFF    11  06244  ¤ 03867 04067
       C   SW     OLSW1&1,OLSW2&1     SET TO BR - NO OVERLAP AVAILABLE   11  06255  , 03933 04133
CK4PRI     BCE    *&18,SYS1&8,1       BR IF PRIORITY ON SYSTEM           12  06266  B 06295 01264 1
           CW     BXPA1&1,BXPA2&1                                        11  06278  ¤ 05771 03723
           CW     BEPASW&1            DO NOT ENTER ALERT MODE             6  06289  ¤ 03544
           R      0,RAREA1            DUMMY READ TO TURN OFF READER EOF  10  06295  M %10 07152 R
                                                                                      G
           BA1    *&1                                                     7  06305  R 06312 M
           S      SXRC                ZERO INDEX REG USED FOR COUNTER     6  06312  S 00094
           S      SXRD                ZERO INDEX REG USED FOR COUNTER     6  06318  S 00099
           CW     TP1BZY,TP2BZY       CLEAR TAPE BUSY SWITCHES           11  06324  ¤ 01643 01645
           CW     ERRSW2&1            TURN OFF CH 2 ERROR SWITCH          6  06335  ¤ 02066
```

```
LABEL     OPCOD  OPERAND                                          CT  ADDRS  INSTRUCTION
*                SET UP TO ALTER FOR CHANNEL 1 UNOVERLAP
ALT4OP    B      I-A-R          ROUTINE TO SET I/O INSTS          7  06341  J 01403
          DCW    PTAPE2         ADDR TO START SCAN TO ALTER       5  06352  03060
                 PTAPE1         ADDR TO STOP  SCAN TO ALTER       5  06357  02606
          DC     a%a            I/O SPECIFIC MODE CHARACTER -X1   1  06358
*                SET UP TO ALTER FOR CHANNEL 2 UNOVERLAP
          B      I-A-R          ROUTINE TO SET I/O INSTS          7  06359  J 01403
          DCW    CPURTS         ADDR TO START SCAN TO ALTER       5  06370  03514
          DCW    PTAPE2         ADDR TO STOP  SCAN TO ALTER       5  06375  03060
          DCW    a¤a                                              1  06376
          BCE    *&8,SYS1&7,1   CHECK SYS CARD FOR OVERLAP       12  06377  B 06396 01263 1
          B      CK4RDY                                           7  06389  J 06444
          BCE    CK4RDY,TAD4,1  TAD SET FOR UNOVERLAP OPERATION  12  06396  B 06444 01004 1
*                SET UP TO ALTER FOR CHANNEL 1 OVERLAP
          B      I-A-R          ROUTINE TO SET I/O INSTS          7  06408  J 01403
          DCW    PTAPE2         ADDR TO START SCAN TO ALTER       5  06419  03060
                 PTAPE1         ADDR TO STOP  SCAN TO ALTER       5  06424  02606
          DC     aaa            I/O SPECIFIC MODE CHARACTER -X1   1  06425
*                SET UP TO ALTER FOR CHANNEL 2 OVERLAP
          B      I-A-R          ROUTINE TO SET I/O INSTS          7  06426  J 01403
          DCW    CPURTS         ADDR TO START SCAN TO ALTER       5  06437  03514
          DCW    PTAPE2         ADDR TO STOP  SCAN TO ALTER       5  06442  03060
          DCW    a*a                                              1  06443
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LABEL     OPCOD  OPERAND                  CT  ADDRS  INSTRUCTION
CK4RDY C  BCE    *&8,CHN1&2,1             12  06444  B 06463 01291 1
       C  B      CK4CH2                    7  06456  J 06554
       C  S      SXRA                      6  06463  S 00074
SETNR1    MLNS   SXRA,TDSCH1&SXRA         12  06469  D 00074 010K0 1
NXTON1    A      *-10,SXRA                11  06481  A 06481 00074
          BCE    CK4CH2,SXRA,0            12  06492  B 06554 00074 0
          MLNS   SXRA,*&4                 12  06504  D 00074 06519 1
          RWD    10                       5  06516  U %U0 R
          BNR1   SETNR1                   7  06521  R 06469 1
                                                    G
          BA1    *-18                     7  06528  R 06516 M
          MLCS   ABLANK,TDSCH1&SXRA       12  06535  D 05269 010K0 3
          B      NXTON1                   7  06547  J 06481

CK4CH2 C  BCE    *&8,CHN2&2,1             12  06554  B 06573 01348 1
       C  B      WAITSW                    7  06566  J 06664

          S      SXRB                      6  06573  S 00079
SETNR2    MLNS   SXRB,TDSCH2&SXRB         12  06579  D 00079 010C0 1
NXTON2    A      *-10,SXRB                11  06591  A 06591 00079
       C  BCE    WAITSW,SXRB,0            12  06602  B 06664 00079 0
          MLNS   SXRB,*&4                 12  06614  D 00079 06629 1
          RWD    20                       5  06626  U ¤U0 R
          BNR2   SETNR2                   7  06631  X 06579 1
                                                    G
          BA2    *-18                     7  06638  X 06626 M
          MLCS   ABLANK,TDSCH2&SXRB       12  06645  D 05269 010C0 3
          B      NXTON2                   7  06657  J 06591

WAITSW C  NOPWM                           1  06664  N
       C  B      SETOFF                   7  06665  J 06685
       C  SW     WAITSW&1                 6  06672  , 06665
       C  B      CK4RDY                   7  06678  J 06444

SETOFF C  CW     WAITSW&1                 6  06685  ¤ 06665
      **** B     START1                   7  06691  J 02007
          H      DEFINE PRECEDING BRANCH LENGTH  1  06698  .
```

```
LABEL     OPCOD  OPERAND                                          CT  ADDRS  INSTRUCTION
*                OUTPUT AREAS

          ORG    *&X00                                                06700
          ORG    *-1              STEP BACK ONE                       06699
          DA     1X133,G          WRITE AREA                          06699
                 1,1                                                  06699
WAREA1           2                START OF WRITE AREA                 06700
END1             133              END   OF WRITE AREA                06831

          ORG    *&X00                                                06900
          ORG    *-1              STEP BACK ONE                       06899
          DA     1X133,G                                              06899
                 1,1                                                  06899
WAREA2           2                START OF WRITE AREA                 06900
END2             133              END   OF WRITE AREA                07031

PAREA1    EQU    END1-79          PUNCH AREA CH1
PAREA2    EQU    END2-79          PUNCH AREA CH2

*                INPUT  AREAS

          ORG    *&X00                                                07100
TAREA1    DA     1X132,G          READ AREA FOR TAPE CH 1             07100

          ORG    *&X00                                                07300
TAREA2    DA     1X132,G          READ AREA FOR TAPE CH 2             07300

RAREA1    EQU    TAREA1&52        READ AREA CH 1-CARDS & PAPER TAPE
RAREA2    EQU    TAREA2&52        READ AREA CH 2-CARDS & PAPER TAPE
```

```
LABEL     OPCOD  OPERAND                                                  CT  ADDRS  INSTRUCTION

*                CONSTANTS AND DATA

FIVE      EQU    MULT1-15
TWELVE    EQU    ALLIND-4
                 LLG   R.D     W8SS  .GTQ                !
          DCW    @ .¤BTM&$*B,L-/,%SSM8#@.TMMA8CDEFGHI.JKLMNOPQR*STUV@    50  07482
COLSEQ    DC     @WXYZ01234567890                                         14  07496
8LANKS    DCW    @     @           FIVE BLANKS                .          5  07501
ALLIND    DCW    @12488A@          ALL STATUS INDICATORS                 6  07507
CPUCNT    DCW    0000              PASSES THRU CPU ROUTINES              4  07511

                 .  W R L
MULT1             @54EDNMVU.@S%8*8¤@                                      16  07527
MULT2             @9999999999999991@                                      16  07543
PRODCT            @0545454545454545345454545454545F@                      33  07576
MULFLD            @                                  @                    33  07609
DIV1              @12345678898888888990                                   20  07629
DIV2              @123456789M@                                            10  07639
                    Q
DIV3              @000000000099999999910012345678I@                       31  07670
8AR       DCW    @     @           STORE 8 ADDRESS REGISTER               5  07675
CTLFLD            @    @            EDIT CONTROL FIELD                     4  07679
8AROK             CTLFLD-4          CORRECT 8 ADDR AT END OF EDIT          5  07684  07675
          PST
          END    2000                                                             J02000
                 @ *$0@                                                   4  07688
                 @6.0@                                                    3  07691
                 @$6.0@                                                   4  07695
                 @17@                                                     2  07697
                 @7@                                                      1  07698
                 @6@                                                      1  07699

                                  END OF ASSEMBLY
```